SBS Series

Brushless DC Motor Driver User's Manual

Made by TROY Enterprise Co., Ltd

Environment Responsibility

- TROY is always committed to environment protection. All packaging material is recyclable and reusable.
- If disposing of used product, please recycle by type as per waste disposal procedures.

----------Protect the green earth with your care and commitment----------

※The product is subject to design modification for performance improvement without prior notice. For more details please contact your local seller.

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※For any operational or technical question with the product, please contact us for professional service「**0800-450-168**」during our business hours.

Precautions

Precautions for using

1.Thank you for purchasing TROY products. Please read this user's manual thoroughly before installing and operating the driver, and always keep the manual where it is readily available.

2.The products described in this manual has been designed and manufactured for use in industrial machinery, and must not be used for any other purpose. We are not responsible for any damage caused through failure to observe this warning.

3.Check that the motor, driver and any accessories are all present. If an accessory is missing or damaged, contact the nearest our branches.

4.Never disassemble the motor and driver. Damage or performance impairment may result. Disassembly voids all warranties.

Precautions for maintenance

Check the ambient environments, clean the system equipment to remove dust and tighten the screws periodically. Also pay attention to the followings.

1. Contact us when repairs become necessary.
2. Since the temperature of the frame of the driver can rise high, be careful when conducting maintenance work or inspection work.

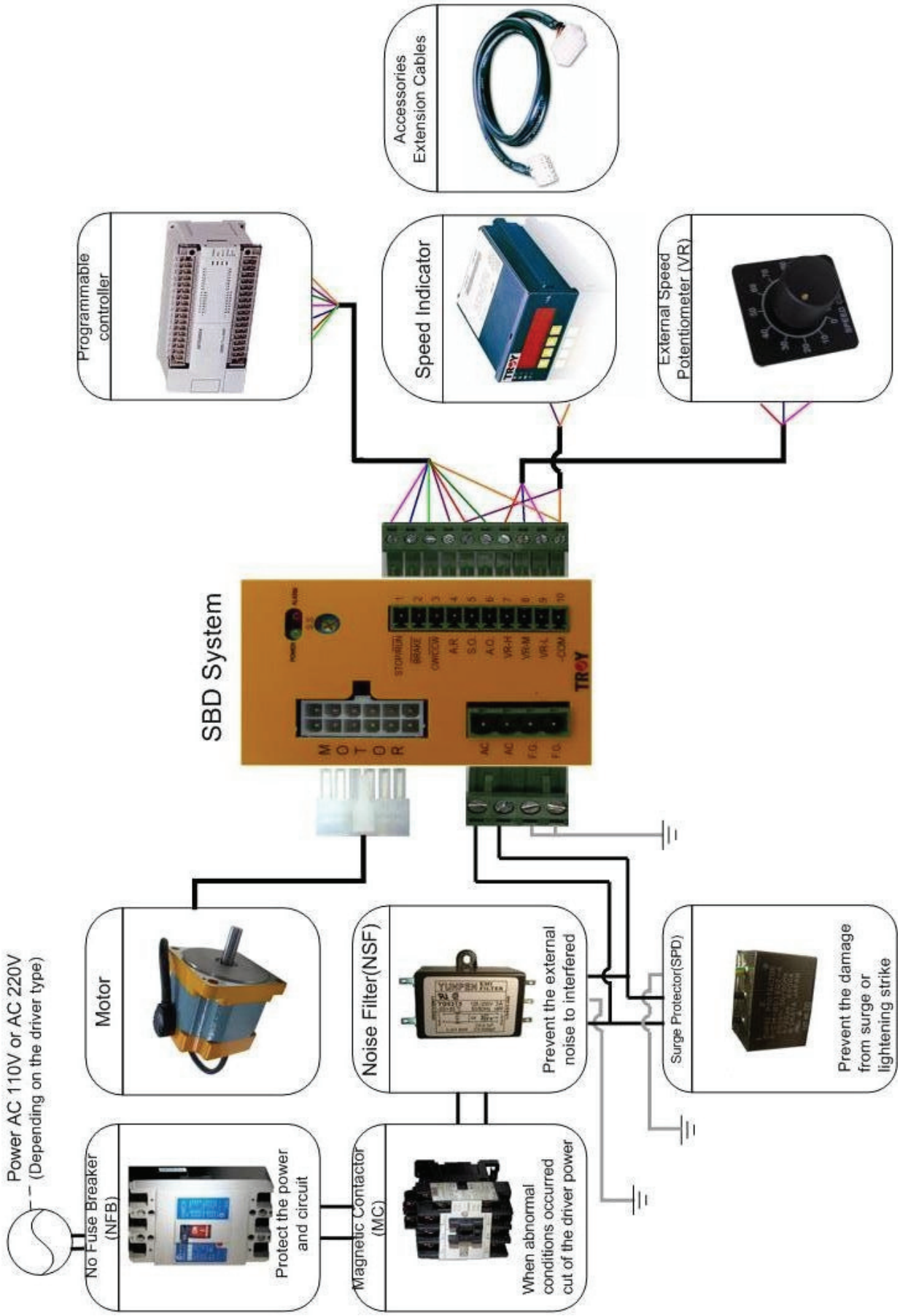
Precautions for warranty period

Within the period of one year after delivery of the system equipment, when failures occurring from design error or fabrication error attributable to the manufacture side occur, we will be repairing the failure free of charge within the reparable range or will replace with substitute. (We cannot hold ourselves responsible for breakage and accidents occurring from your use beyond the specified range described in this document.)

Precautions for disposal

When disposing of the driver and the motor, treat them as ordinary industrial waste.

1.SBD System


Accessories
Extension Cables
Programmable controller
Speed Indicator
External Speed Potentiometer (VR)
SBD System
STOP/BRK
BRAKE
CW/CCW
A.R
S.O
A.O
VR-H
VR-M
VR-L
-COM
MOTOR
AC
AC
F.G
F.G
Power AC 110V or AC 220V
(Depending on the driver type)
Motor
Noise Filter(NSF)
Prevent the external noise to interfered
Surge Protector(SPD)
Prevent the damage from surge or lightening strike
No Fuse Breaker (NFB)
Protect the power and circuit
Magnetic Contactor (MC)
When abnormal conditions occurred cut of the driver power

2. Specs

Motor output			20W	40W	60W	90W
Round shaft			6B20S-□N	6B040S-□N	9B060S-□N	9B090S-□N
Pinion shaft			6SBS020P-□N	6BS040P-□N	9B060P-□N	9B090P-□N
Drive model			SBD020-□	SBD040-□	SBD060-□	SBD090-□
Input Power	-Type 1 AC110~115V±15% 50 / 60 Hz	Max Current	2.4A	2.4A	2.5A	2.9A
		Rated Current	0.59A	0.99A	1.48A	1.93A
	-Type 2 AC220~230V±15% 50 / 60 Hz	Max Current	1.7A	1.7A	1.7A	1.7A
		Rated Current	0.33A	0.56A	0.82A	1.05A
Starting torque (Kgcm/Nm) Rated Torque (Kgcm/Nm) Permissible load inertia (GD^2)			1.5/0.15 1.0/0.10 14.01Kgcm^2	2.5/0.25 2.0/0.20 9.55Kgcm^2	4.5/0.45 3.0/0.30 39.42Kgcm^2	6.5/0.65 5.0/0.50 54.23 Kgcm^2
Speed range			250~2000rpm (Rated toque output)			
Speed variation	To load		-1% (at 2000 rpm with no-load ~rated load)			
	To voltage		±2% (Power voltage variation: -1 type is±15%,-2 type is±10% at 2000rpm under no load)			
	To temp.		±2% (0~40℃, at 2000 rpm with no-load)			
Speed control			●Controlled by the external speed potentiometer (Variable resistor at 20 kΩ). ●Controlled by DC voltage (at DC 0~5V/).			
Signal input			●Photocoupler input interface. ●Stop/Start input.Brake input,.CW/CCW input.ALARM clear input			
Signal output			●Open Collector output interface. ●Speed signal and ALARM signal output			
Functions			●Input/output signal contact which can connect to PLC I/O contact control directly ●Motor flat torque output within 250~2000RPM ●It has instantaneous brake stop,clockwise/ counterclockwise,natural stop,slow start/slow down ●When brake stop it has electrical holding torque function The protection function activated,motor will stop and the 「ALARM」red light lit up during motor over load/over speed/over heat/controller over voltage/controller low voltage/motor cable broken			

※Please fill the power in the box—□，"1"indicates AC110~115V±15%；"2" indicates AC220V~230V ±15%

2.1Motor/Controller specs

Item		Controller	Motor
Insulating resistance		When tested with DC500V high resistance meter, the resistance between power, F.G ground, and I/O contact terminal is over 100MΩ.	When tested with DC500V high resistance meter, the resistance between wires and motor case is over 100MΩ.
Dielectric strength		No abnormal condition when supplying 1.8KV/60Hz voltage between the power and the F.G ground connection terminal and 3KV/60Hz voltage between the power and I/O connection terminal for one minute.	No abnormal condition when supplying 1.8KV/60Hz voltage continued 1 sec.
Environmental conditions	Temperature	0~40℃	0~50℃
	Humidity	Within 85%	
	Atmosphere	No corrosive gases,dust,water or oil	

3.Verifying the combination when purchased

Upon opening the package, verify that the items listed below are included then install, wring and operating. If there is any problem please contact our branch.

3.1 Verifying the content of package

Round type/Pinion type ※Note:The pinion type has to attached with「GEARHEAD」then it can install

Item	Quantity
Controller	1
Mounting plate （Attached with flat screwsX4PCS）	2
Variable resistor	1
Signal insulated cable（For variable resistor）	1
Connector (10 pins&4 pins)	1
User's manual	1
Motor	1

3.2Verifying the product number code

●If you purchased is the 「Round type」please check the combination as below:

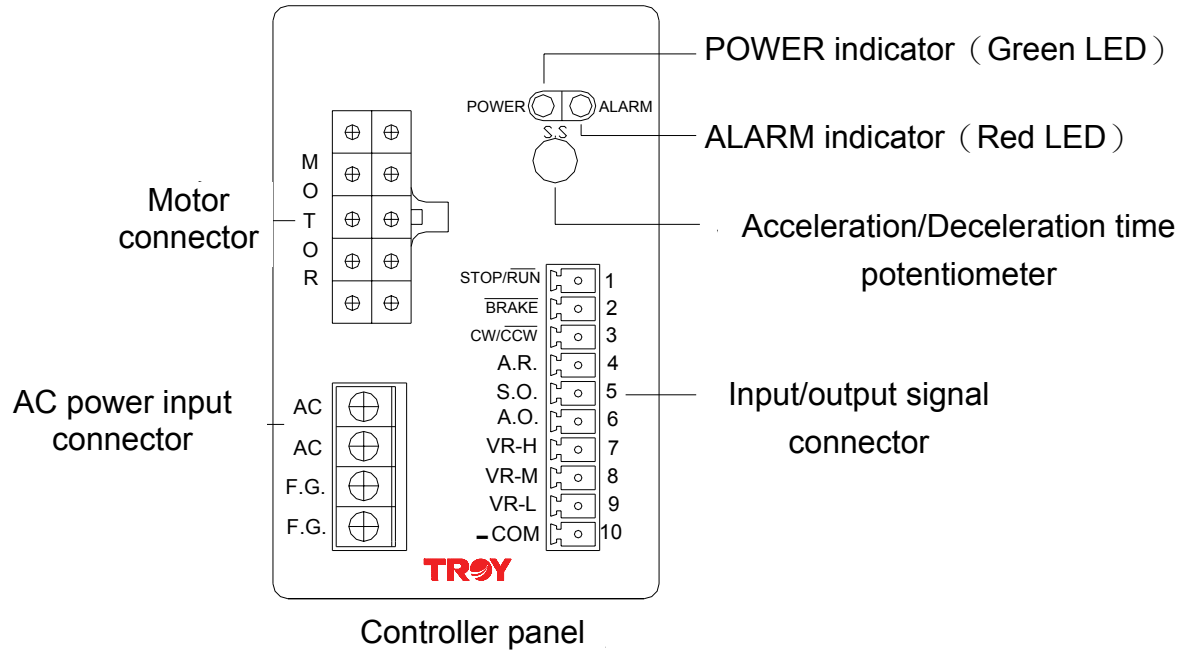
Power	Voltage spec	Name of combination	Name of motor	Name of controller
20W	AC110V~115V	6SBS020S-1N	6B020S-1N	SBD020-1
	AC220V~230V	6SBS020S-2N	6B020S-2N	SBD020-2
40W	AC110V~115V	6SBS040S-1N	6BS040S-1N	SBD040-1
	AC220V~230V	6SBS040S-2N	6BS040S-2N	SBD040-2
60W	AC110~115V	9SBS060S-1N	9B060S-1N	SBD060-1
	AC220~230V	9SBS060S-2N	9B060S-2N	SBD060-2
90W	AC110V~115V	9SBS090S-2N	9B090S-1N	SBD090-1
	AC220V~230V	9SBS090S-2N	9B090S-2N	SBD090-2

●If you purchased is the 「Pinion type」please check the combination as below:

Power	Voltage spec	Name of combination	Name of motor	Name of controller
20W	AC110V~115V	6SBS020P-1N	6B020P-1N	SBD020-1
	AC220V~230V	6SBS020P-2N	6B020P-2N	SBD020-2
40W	AC110V~115V	6SBS040P-1N	6BS040P-1N	SBD040-1
	AC220V~230V	6SBS040P-2N	6BS040P-2N	SBD040-2
60W	AC110~115V	9SBS060P-1N	9B060P-1N	SBD060-1
	AC220~230V	9SBS060P-2N	9B060P-2N	SBD060-2
90W	AC110V~115V	9SBS090P-2N	9B090P-1N	SBD090-1
	AC220V~230V	9SBS090P-2N	9B090P-2N	SBD090-2

※Note: If you purchased is the 「Pinion type」please select the 「GEARHEAD」to attached with

4.Function of driver



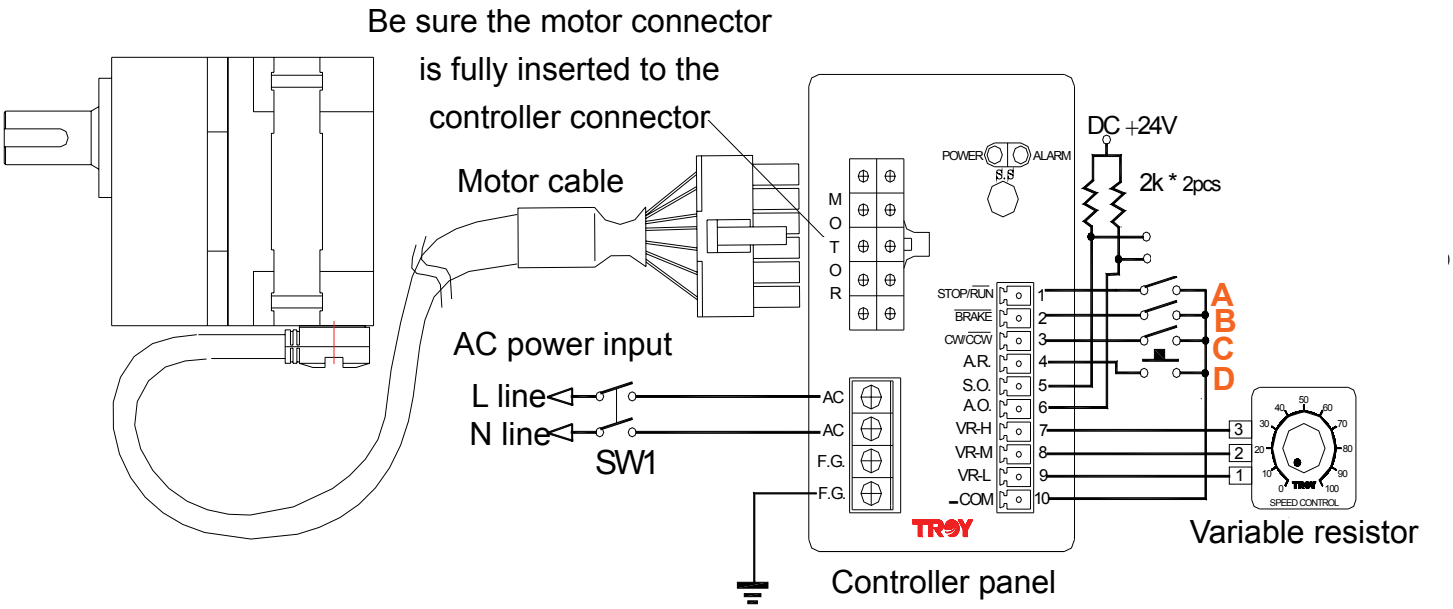
<table>
<tr><td>Item</td><td>Functions</td></tr>
<tr><td>Motor connector</td><td>Please insert the motor cable</td></tr>
<tr><td>AC power input connector</td><td>Please input the AC power voltage according to the specs of controller
「AC」contact：Please connect power line N and L
「FG」contact：Please contact to frame ground of the system
「NC」contact：Not used
Note：The mark of controller voltage specs
「-1」indicates→Single phase AC110~115V±15% 50/60Hz
「-2」indicates→Single phase AC220~230V±15% 50/60Hz</td></tr>
<tr><td>Power LED(Green)</td><td>When AC power is on, the「POWER」green light on the front panel will lit up</td></tr>
<tr><td>ALARM LED (Red)</td><td>The protection function activated, motor will stop and the「ALARM」red light lit up during motor over load/ controller low voltage/controller over voltage</td></tr>
<tr><td>Acceleration/Deceleration time potentiometer</td><td>SS(Slow-start)Acceleration time max 8 sec(0~2000RPM within no load)
SD(Slow-down)Deceleration time max 7 sec(2000RPM~0RPM +within no load)</td></tr>
<tr><td>Input/Output signal connector</td><td>
<table>
<tr><td>No.</td><td>Name of panel</td><td>Name of function</td><td>Function</td></tr>
<tr><td>1.</td><td>STOP/RUN</td><td>STOP/RUN</td><td>Input signal level「L」→Start「H」→Stop ※2</td></tr>
<tr><td>2.</td><td>BRAKE</td><td>Brake stop</td><td>Input signal level「L」→Brake stop 「H」→Stop normally</td></tr>
<tr><td>3.</td><td>CW/CCW</td><td>Clockwise rotation input/Counterclockwise rotation input</td><td>Input signal level「L」→Counterclockwise rotation
「H」→Clockwise rotation</td></tr>
<tr><td>4.</td><td>A.R.</td><td>LARM release</td><td>Alarm Reset, input「Negative trigger signal」→ALARM release</td></tr>
<tr><td>5.</td><td>S.O.</td><td>Speed output signal</td><td>Used when monitoring the rate of rotation, pulse signals output 12Pulse/ rotation</td></tr>
<tr><td>6.</td><td>A.O.</td><td>ALARM output signal</td><td>The signal is output when motoroverload/overspeed/
overheat/controller overvoltage/controller low voltage/motor cable broken.At the same time motor will stop normally</td></tr>
<tr><td>7-9.</td><td>VR-H/M/L</td><td>External speed potentiometer</td><td>Setting motor rotation speed via connecting speed potentiometer or DC voltage(0~5V)</td></tr>
<tr><td>10.</td><td>-COM</td><td>Control signal power GND</td><td>Ground terminal for input/output signals and external DC power GND</td></tr>
</table>
</td></tr>
</table>

※1.Acceleration/Deceleration time will be different because of load type(ex:Inertia,friction)

※2. 「L」means contact connected with 「-COM」;「H」means no connect (For details please refer to the wiring)

5.Installation

5.1Wiring



A：Speed signal output (12 pulses are output for each rotation)

B：Alarm signal output (It is activated when L level output)

C：ON--Start/OFF--Stop

D：ON--Brake stop/OFF--Stop normally

E：ON—Counterclockwise/OFF--clockwise

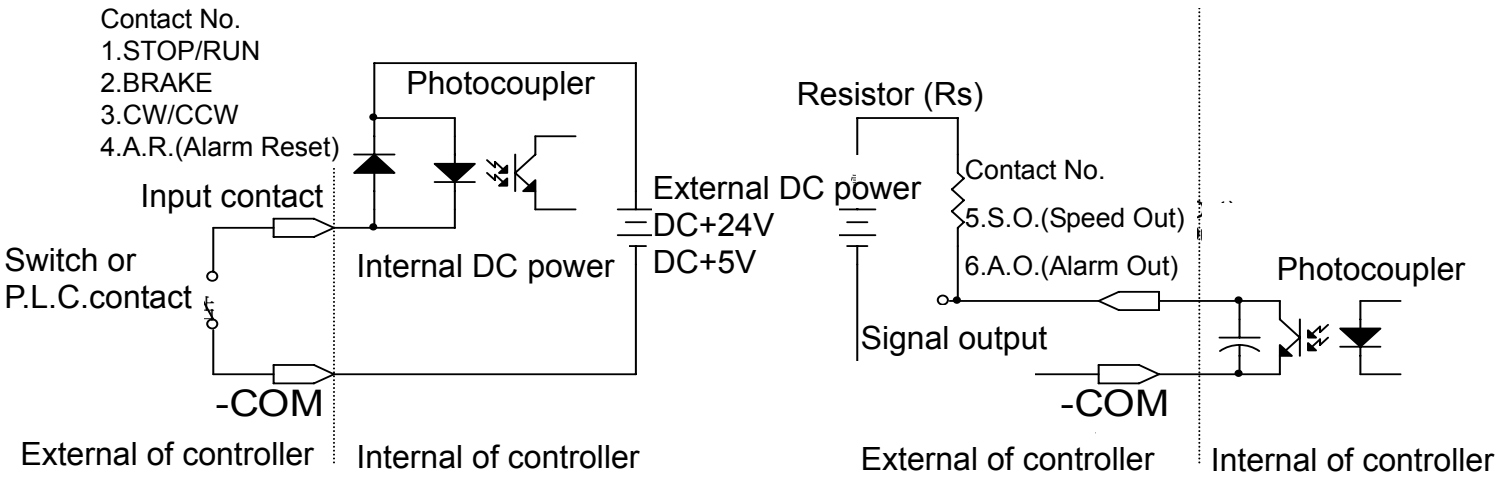
F：When triggered ON--Alarm release

5.2 Noise interference prevention

Noise interference channel	Preventive measures
Input/output signal cable	1. Arrange short-distance wiring and the wire should be less than 2m long. Separate the signal wires from the power cords and the spacing should be over 30cm. 2. When using the external potentiometer(VR) or DC voltage for speed control, use the signal line provided with the unit.
Motor—Driver Connection cable	1. The motor and the drive should be connected with cables. In case of long-distance wiring, please use the optional extension cable to ensure proper wiring. 2. Separate these wires from the power cords and the spacing should be over 30cm.
Power cable	1. Supply the driver with a separate AC power. Do not share the power supply for those devices with radiating noise sources (e.g. High frequency, ultrasonic, welder or thermo coupler etc.)If necessary please install the "No fuse braker"(NFB) to prevent the surge current 2. For the F.G. connection on the driver, use the type 3.It is grounding with short-distance and coarser diameter wires. 3. Install a noise filter in front of the AC power input to shield off external noise interference.

5.3Signal input and output

●Input circuit

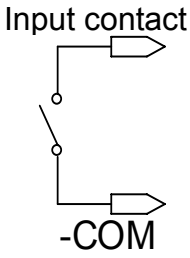


Circuit specs of input surface	Circuit specs of output surface
1.Photocoupler interface circuit and the power supplied by internal DC power 2.「STOP/RUN」「BRAKE」「CW/CCW」contact and acted mode in 「N.C.Normally closed switch」or「Normally open switch」 3.「A.R.」contact acted mode is 「Push buttom switch」triggered time continue more than 10ms after Alarm released then loose the switch	1.Open collector circuit output mode which need external DC power voltage and the voltage value less DC 26V, connected resistor（Rs）and keep current value less 20mA. 「S.O.」「A.O.」signal output via 「Signal output contact」which can measured by voltmeter and the 「external DC voltage」is the level during normal,the 「0V」is the level during action External DC voltage: At DC+24V Rs=1.2kΩ At DC+5V Rs=200Ω

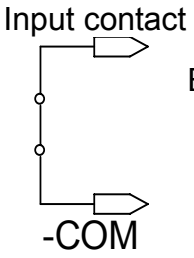
Description of input contact			Description of output contact		
Contact function	Signal condition	Action	Contact function	Signal condition	Action
STOP/RUN	H	Stop operation	S.O. (Speed out)	Pulse signal Minus logical Active"L"	Speed signal output and pulse speed is 1 msec.Motor output 12 pulses every rotation
	L	Start operation			
BRAKE	H	Natural stop			
	L	Brake stop			
CW/CCW	H	Rotation direction is clockwise	A.O. (Alarm output)	Minus logical Active "L"	Controller output the signal and the ALARM LED(Red) lit up
	L	Rotation direction is counterclockwise			
A.R. (Alarm reset)	H	Alarm monitor			
	L	Alarm release			

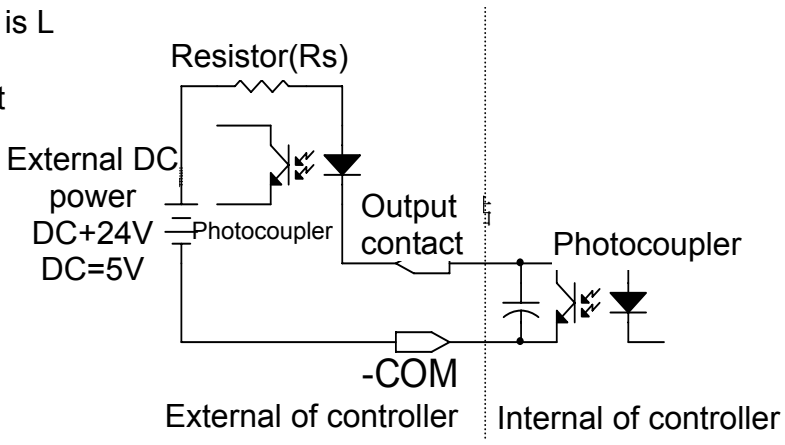
● Definition of contact signal

When contact is H



When contact is L





5.4Operation

●Operation mode setting

Signal input Operation mode	STOP/RUN	BRAKE	CW/CCW	A.R. (Alarm Reset)
Instantaneous clockwise/ counter clockwise	L	H	H→Instantaneous clockwise L→Instantaneous counterclockwise	H
Brake stop	L	L	H or L	H
Brake stop then start or slow start＊	L	L→H	H or L	H
Naturally stop or slow stop＊	L→H	H	H or L	H
Naturally stop then start or slow start＊	H→L	H	H or L	H
Alarm release	H	H	H or L	H→L→H 「L」continued 10ms

「＊」indicates Acceleration/Deceleration time potentiometer，default value is「0」

Cautions：

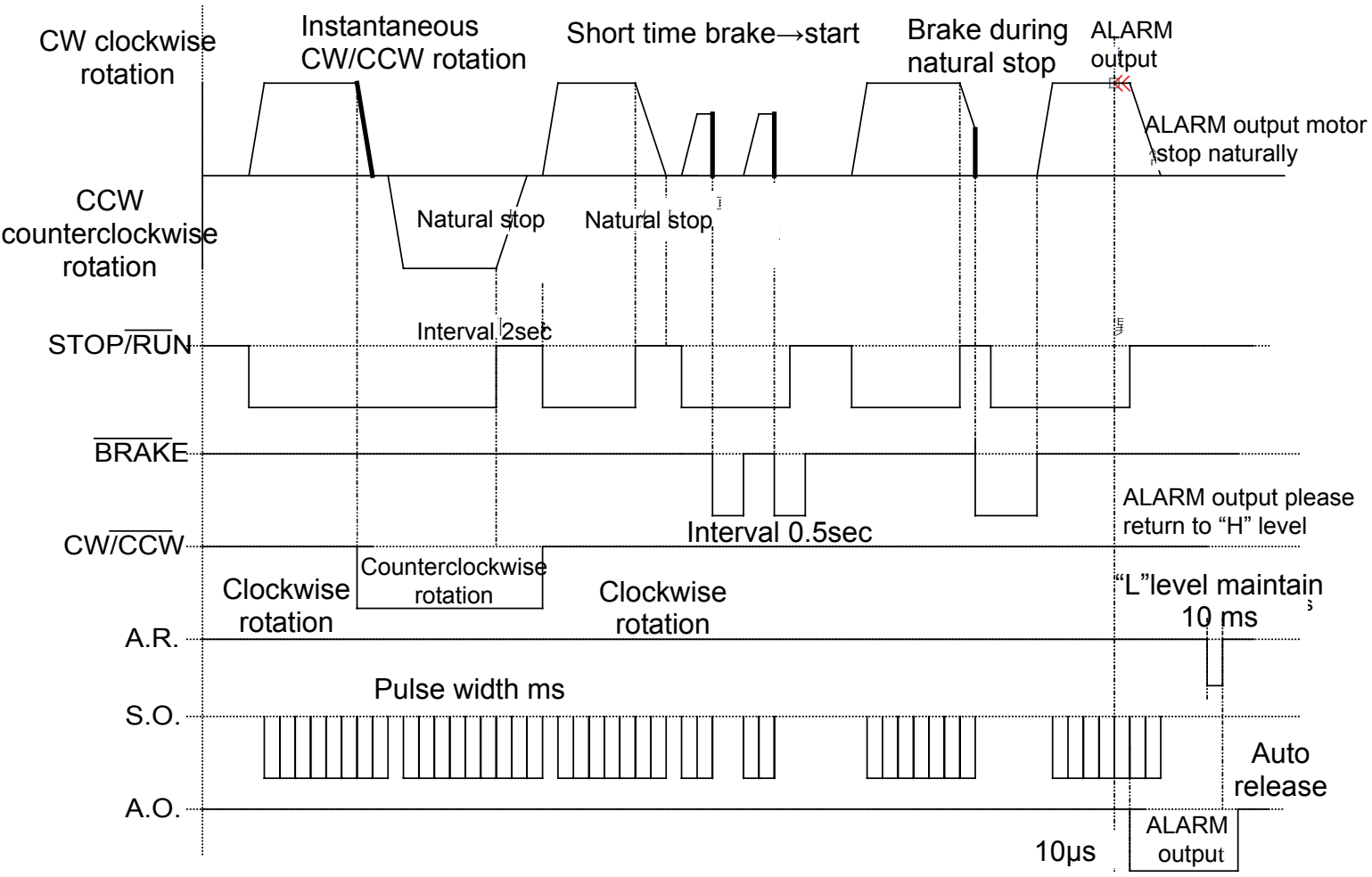
1.A.R.(Alarm Reset)signal：When motor operated please maintain at「H」to make sure the 「Alarm monitor 」circuit of internal controller operated normal.

If maintain at「L」and controller has Alarm condition,the protection functions can not work.A.O.(Alarm Output) can not output the signal which will cause the controller damage easily so please pay attention to edit the control procedure

2.「A.O.」signal output with ALARM led lit up and return the「STOP/RUN」to 「H」which can avoid the unexpected start operation during ALARM release

3.Please do not control the motor start/stop operation by 「Power SW」and motor will start operation while power is turn on.But it will occur the surge current and cause the controller damage easily

●Controller operation timing chart



5.5ALARM protection function

The protection function activated when motor over load/over speed/over heat/over voltage/low voltage/cable broken and motor stop,the 「ALARM」LED(red) lit up at the same time.「A.O.」output contact will output 「H」level and change to the 「L」level

Type of protection function	Description
Over load	Activated when a load exceeding the rated torque is applied to the motor for 7 sec
Over speed	Motor speed over 3000rpm
Over heat	The protection function will be triggered when the internal heatsink temperature of the driver exceeds 80℃
Over voltage	1. The protection function will be triggered when the motor operates with loads exceeding the permissible load inertia, or when the motor is used in up and down vertical movements. 2.During motor operation,the AC power voltage AC 110V or AC 220V which input to the driver is over 35%
Low voltage	1.During motor operation, the AC power voltage AC 110V or AC 220V which input to the driver is lower than 20%
Cable broken	Motor cable was broken

Note:If there is any exceptional conditions during motor running,please turn the controller's 「POWER SW 」OFF,then do the wiring,check the load and power voltage.When the expectional conditions eliminated and repeat the above-mentioned steps.At this time 「ALARM」 light will go out.

After electrify the 「ALARM」light lit up, please contact to our local seller.

「ALARM」release：(1)「A.R.」input contact keep at the「L」condition 10ms then back to the 「H」condition.

(2)Please turn the「POWER SW」OFF more than 5sec then input the power

5.6Connection

●Connecting the motor

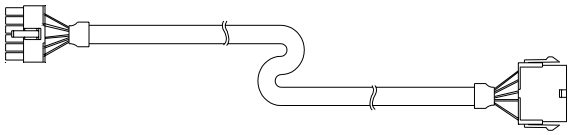
The motor is connected to the driver using the connectors provided.Be sure the motor connector is fully inserted to the controller connector.Please turn the 「POWER SW」OFF while connecting which avoid the improper connection to cause the driver damaged.

The cable can be extended to a maximum of 10m using an extension cable (Sold separately).Please choose the suitable extension cable while ordering.

The total length from motor to controller＝Motor lead length 60 cm+Extension cable length

Model of extension cable	Length(m)
CB-010	1
CB-020	2
CB-030	3
CB-050	5
CB-070	7
CB-100	10

Extension cable



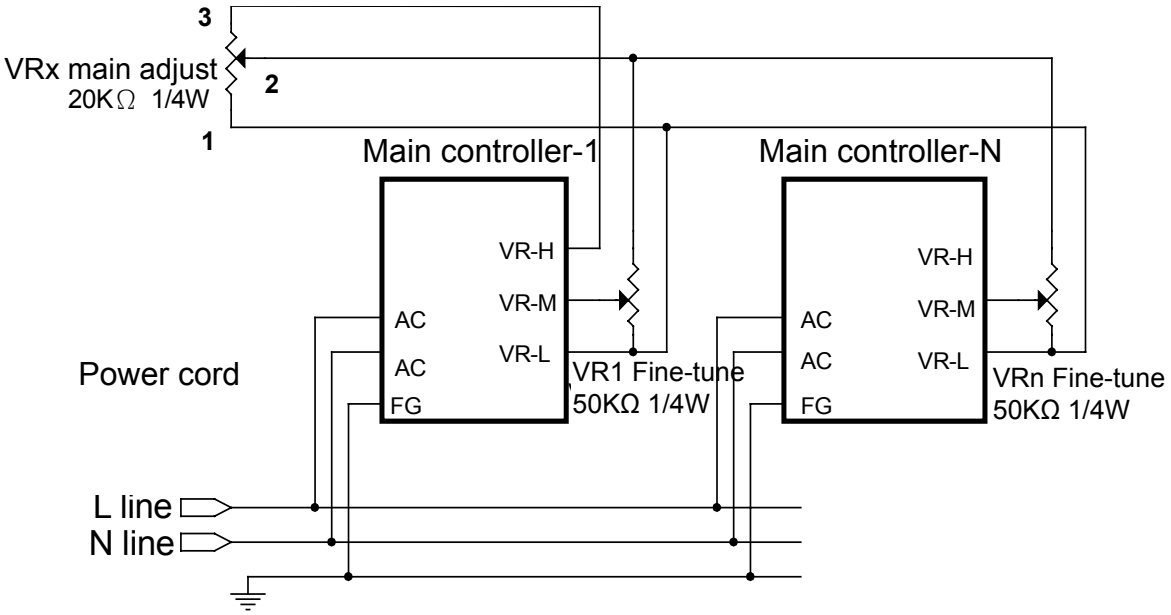
※Actual cable length = Required length + 10cm

●Connecting the AC power

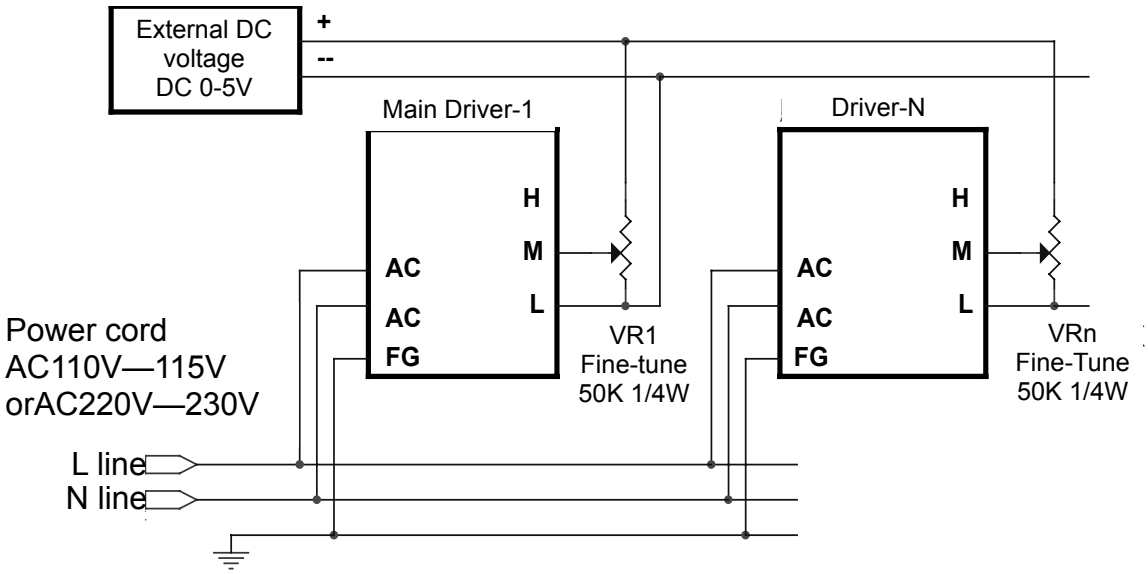
The CE and UL certified terminal board shall be used for the power input. When connecting the driver, fix the power supply wire at the terminal (3-pin accessory) and then insert the terminal into the power terminal jack on the driver. Use **AWG18** power source cable (in profile over 0.75mm^2). The driver power ground (FG) terminal should be connected with Class 3 grounding. Use as short grounding wires as possible (The ground impedance should be less than 100Ω).

5.7Parallel operation and multi-speed control

∗External potentiometer



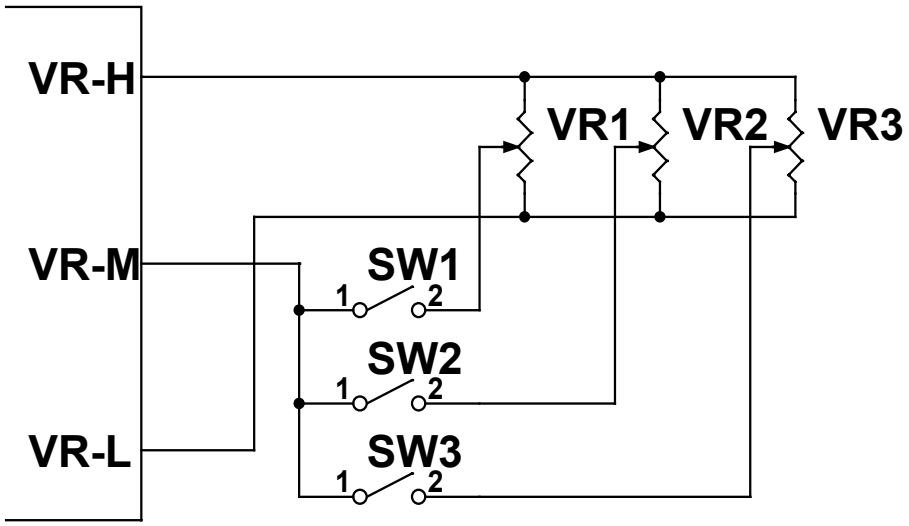
∗DC power



Using the DC power		Using an external speed controller	
DC voltage setting range	DC 0 ~ 5V	Main adjusting resistor VRx	20 (KΩ) 1/ 4 W
DC current capacity	1 mA / units		
Main controller-1 fine-tune resistor VR1	50 KΩ1/4W	Main controller-1 fine-tune resistor VR1	50 KΩ 1/4W
Controller-N fine-tune resistor VRn	50 KΩ1/4W	Controller-N fine-tune resistor VRn	50 KΩ 1/4W

1."N" represents the number of controller for the parallel operation, and do not use over 10 controllers for the parallel operation.
2.Be sure to connect the fine-tune resistor VR1~fine-tune resistor VRn, so as to adjust the speed difference between each motor.
3.Except for the collective connection of main adjusting DC voltage/resistor VRx, other output/input control signals should be connected to each controller separately.

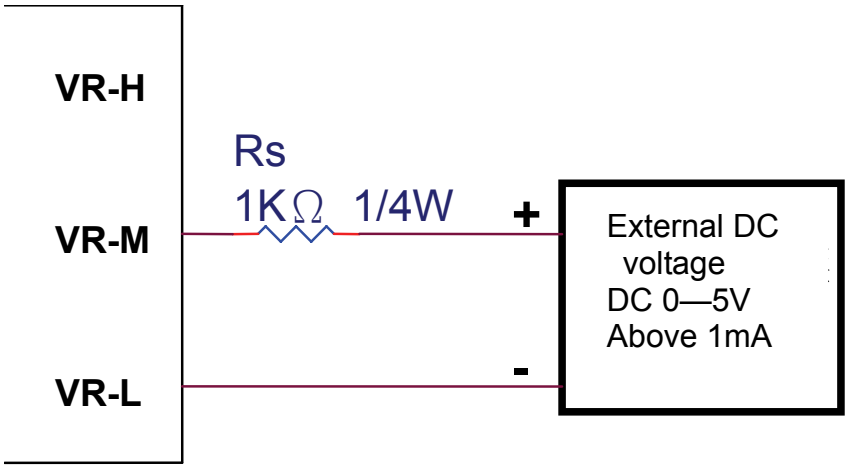
●Multi-speed control



3-step speed switching control			
SW3	SW2	SW1	Resistance
OFF	OFF	ON	VR1
OFF	ON	OFF	VR2
ON	OFF	OFF	VR3

Note:
1.It is recommended to use 20KΩvariable resistor for VR1, VR2 and VR3 (But do not below 10KΩ).
2.The higher the resistance value is, the higher the voltage and the faster the speed.
3.If there required over 3-step speed control, please contact our customer service depart.

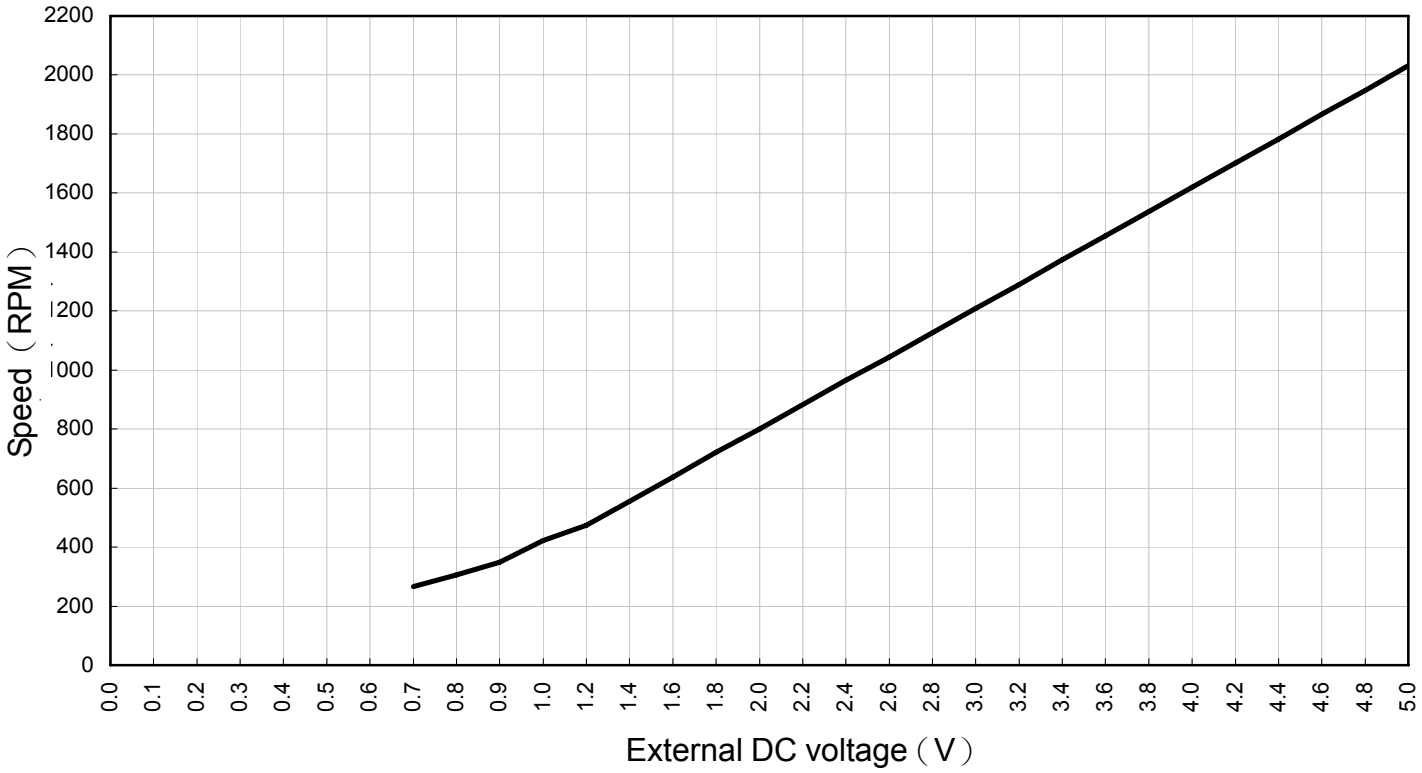
＊Speed controlled by external DC voltage



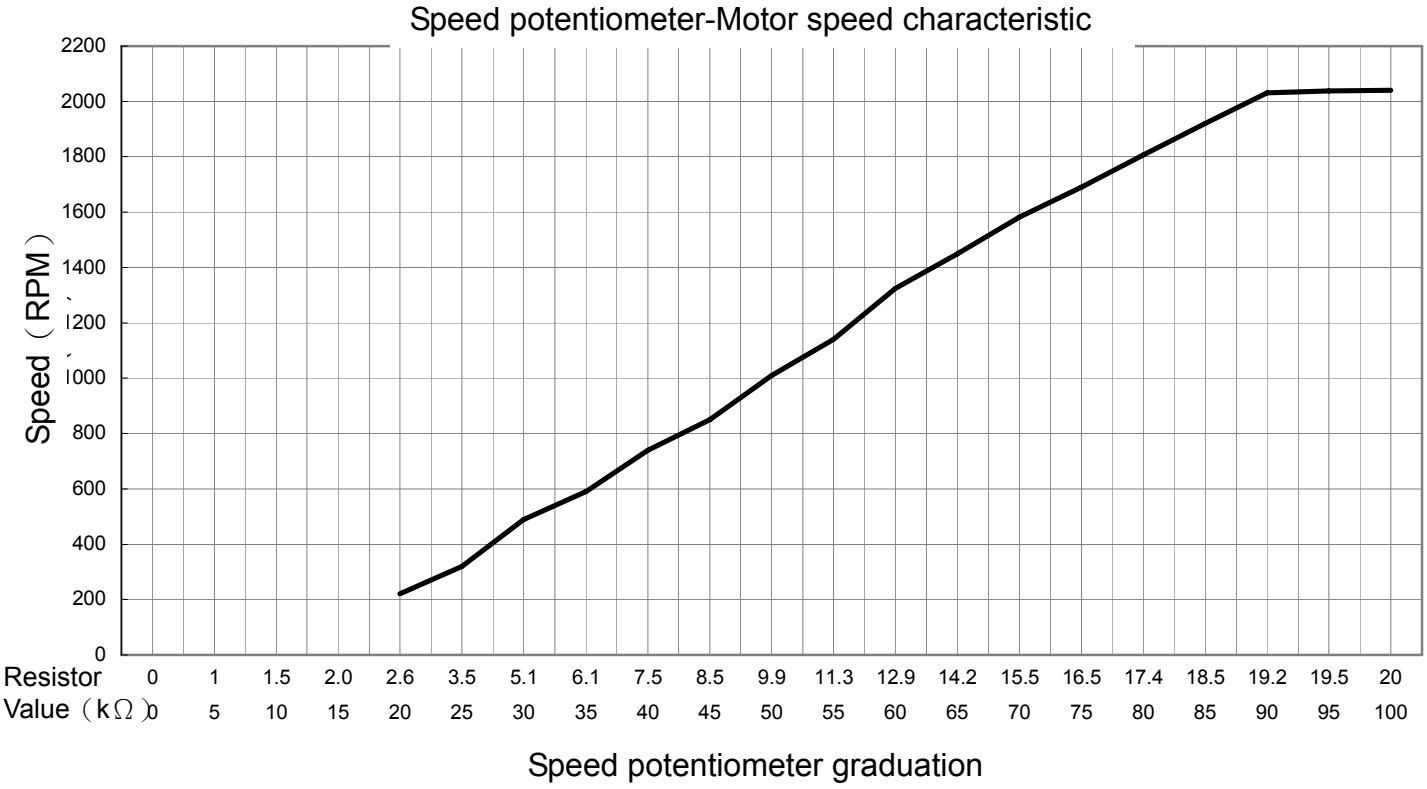
Note:

1. The external DC power output must be connected in parallel with the Rs resistor 1KΩ, 1/4W.
2. Please use the output-insulating DC power supply with ∞ output impedance.

●External DC voltage－Motor speed characteristics

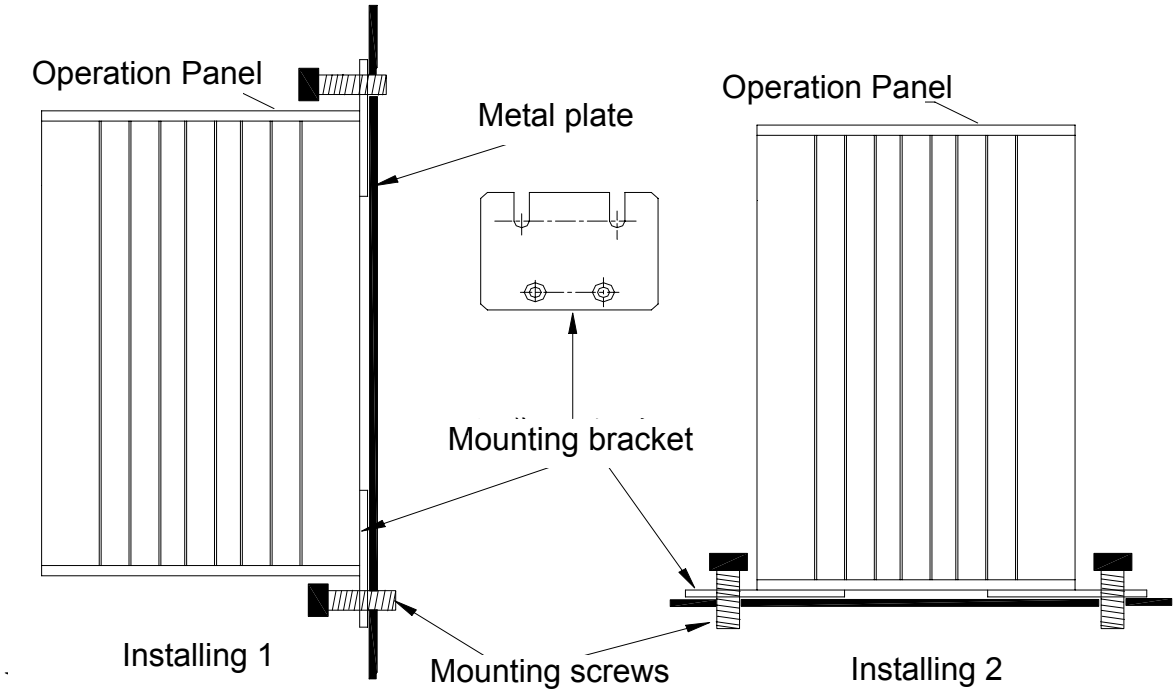


●Speed potentiometer graduation



6.Installation

6.1Installing diagram



※There is also have DIN spec aluminum rail mounting tools(accessories),please contact with our local seller

6.2Installation condition

●Install and use the driver in the environment described as the following:

※Indoor (without direct sun light exposure) or the place that is well ventilated and easy for heat radiation. Don't not expose to the sunlight directly.

※Ambient temperature:

Controller0℃～+40℃ (Avoid freezing).

Motor 0℃～+50℃ (Avoid freezing)

※Ambient humidity: Below 85% (Avoid condensation).

※The place that will not be affected by water, oil, corrosive and flammable gas or dust.

※The place that will not affected by continuous vibration.

●When the driver is installed in an enclosed place or a place where a heating source exists nearby, please watch out for the temperature rise of the driver. It is recommended to use a fan for forced cooling and maintaining the temperature of the driver at below 40^0C so as to avoid excessive temperature inside the driver and activation of the overheat protection function.

●Keep conductive objects (cutting powders, bolts and electrical wire chips, etc.) from getting into the driver.

●Installing multiple drivers:

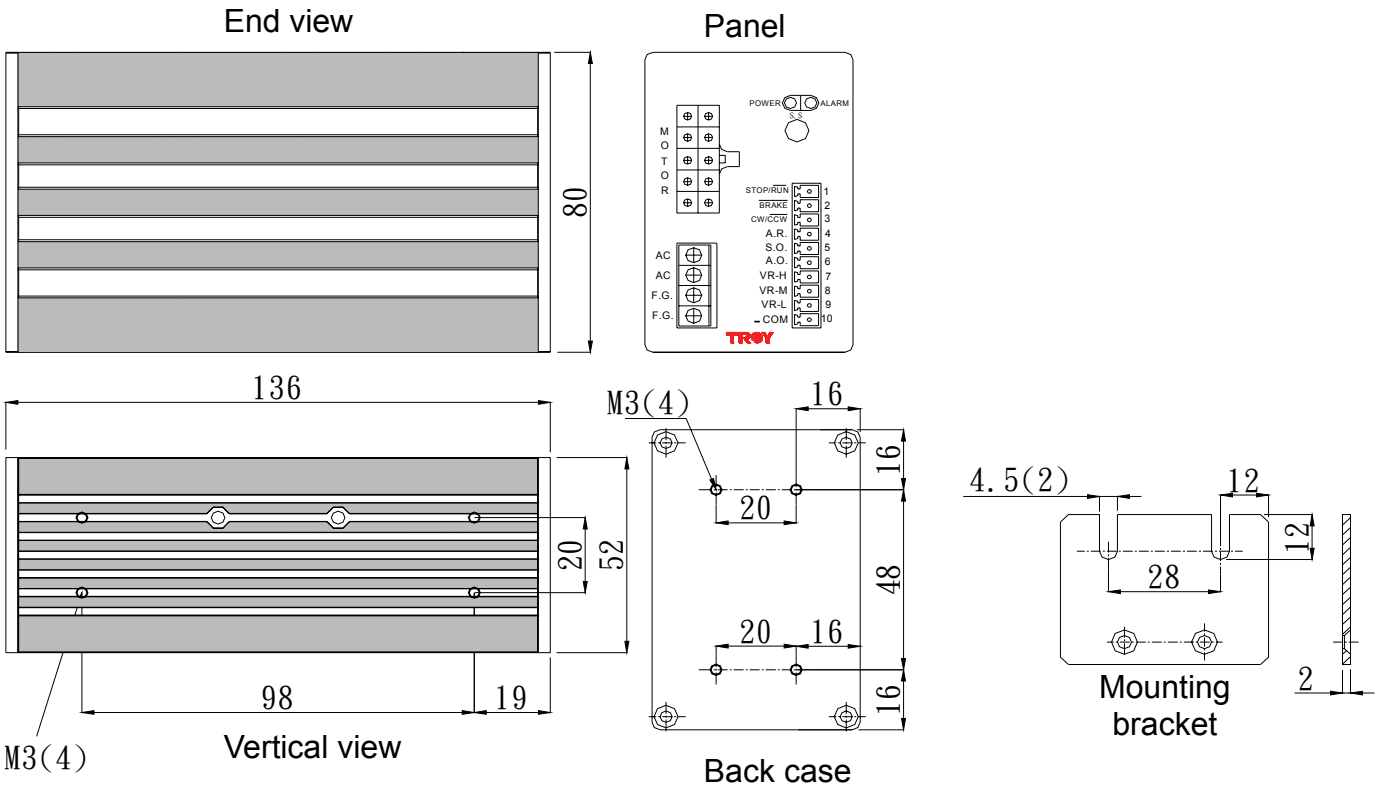
When you install and anchor multiple drives together, be sure to keep a spacing over 25mm between each drive and the drive should have a spacing over 25mm from other peripherals .

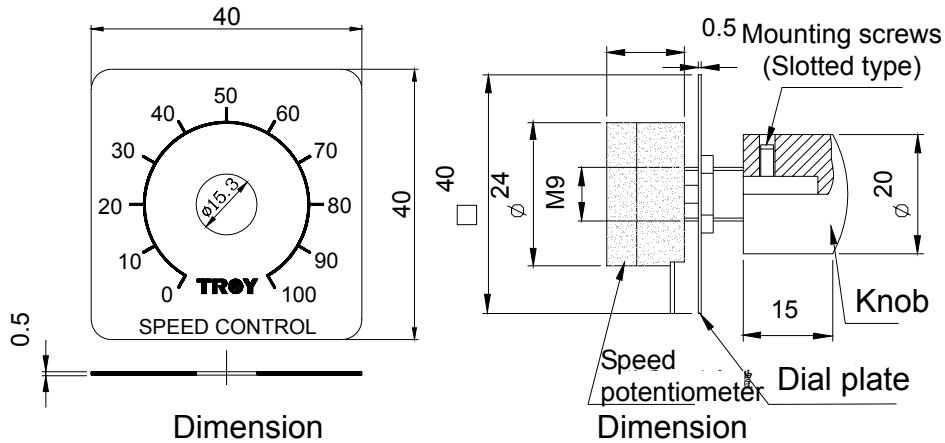
Please refer to the installing diagram

7.Dimension

Model:SBD020-□,SBD040-□,SBD060-□,SBD090-□ Common size

Weight:600g





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